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May 11, 1994

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Mr. William F. Caton
Acting Secretary
Federal Communications Commission
1919 M Street, N.W., Room 222
Washington, D.C. 20006
STOP CODE: 1170

Re: Ex Parte Communication in PR Docket No. 93-61

Dear Mr. Caton:

Pursuant to Section 1.1206(a)(2) of the Commission's Rules, notice is hereby given of an *ex parte* communication regarding the above-referenced proceeding. An original and one copy of this letter and its attachments are being filed with the Secretary's Office.

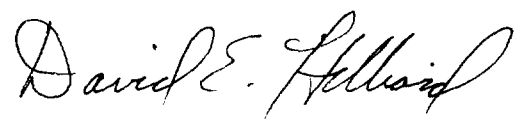
This afternoon, Charles L. Taylor, President, Pinpoint Communications, Inc. ("Pinpoint"), Louis H.M. Jandrell, Vice President Design and Development, Pinpoint, and Richard E. Wiley and David E. Hilliard of Wiley, Rein & Fielding, Pinpoint's counsel, met with Richard M. Smith, Chief of the Filed Operations Bureau ("FOB") and Michael J. Marcus, Assistant Bureau Chief for Technology, FOB.

Messrs. Taylor, Jandrell, Wiley and Hilliard discussed Pinpoint's positions regarding spectrum allocation issues expressed in its pleadings filed in this proceeding.

Attached hereto is a copy of the documents made available during the meeting.

If there are any questions regarding this matter, please contact the undersigned.

Respectfully submitted,



David E. Hilliard
Attorney for Pinpoint Communications, Inc.

Attachments
cc: Mr. Richard M. Smith (w/attachs.)
Dr. Michael J. Marcus (w/attachs.)

COMMUNICATIONS, INC.

PR Docket No. 93-61
Ex Parte Presentation

May 11, 1994

Wide-Area AVM Serves Important Public Interest Objectives

- Intelligent Vehicle-Highway Systems (IVHS)
  - Metropolitan-area traffic monitoring and control
  - Mass transit systems management
  - Public and private safety systems
  - Emergency roadside assistance
  - In-vehicle information
- Commercial fleet management
- Stolen vehicle recovery
- Advantages over other vehicle location systems, such as GPS
  - Far superior urban coverage -- where demand is greatest -- because not blocked by buildings and trees
  - With GPS, only the vehicle knows where it is; a second radio system must be established to transmit location information from mobile to central processing center
  - GPS is a solution to a limited part of the IVHS puzzle

The Wide-Area AVM Marketplace Should be Governed by Competition

- Record reveals a diversity of approaches
  - Signals the fact that different developers are targeting different markets
  - Foreshadows potential for healthy competition
- Final rules for 902-928 MHz should accommodate this diversity to the extent practicable
- Commission recognizes that, where possible, competition should decide which systems best serve the public interest

Pinpoint
COMMUNICATIONS, INC.

Pinpoint's ARRAY™ System

- Spectrally efficient AVM system designed to operate in the high-noise environment of the 902-928 MHz band
  - 12-16 MHz spectrum requirements of the system can be met on a **shared** basis
  - ARRAY™ system can co-exist with other users of the 902-928 MHz band (ISM, government, local-area AVM, amateurs, Part 15)
  - Other wide-area AVM systems hope to use lower power levels and employ longer communications ranges that are simply not suitable for reliable, relatively interference-tolerant operation in the band
- Supports the high-capacity, accurate vehicle location needed for IVHS
  - 1,000-3,000 vehicles per second per market (raw 30-foot accuracy, 95% of time)
  - 10-250 times as much location capacity as other wide-area systems
  - Many of the IVHS initiatives require ARRAY™ network's capacity
    - Teletrac's small capacity would almost be consumed by a police department in a medium-sized metro area
    - SW Bell's minuscule system nearly would be exhausted by a moderately sized taxi company
- ARRAY™ integrates high-speed data-messaging (approx. 300 kbps) with vehicle location function
- ARRAY™ proven in Washington experimental system

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The Entire 902-928 MHz Band Should Be Made Available to Wide-Area Systems

- Intentions of the various wide-area systems to meet demand for AVM require access to entire 26 MHz of 902-928 MHz band
- Wide-area systems are compatible with local-area systems
  - Wide-area AVM operators have indicated that wide-area systems can operate sufficiently well in the presence of local-area systems
  - Local-area systems have not indicated that wide-area systems are a potential interference problem
- Wide-area systems can and should be designed to operate reliably in the presence of reasonable levels of Part 15 operation
  - Part 15 devices should continue to be allowed to operate throughout 902-928 MHz band consistent with obligations of noninterference

Part 15 Concerns Cannot Be Applied Equally to All Wide-Area Systems

- Part 15 industry concerned that wide-area systems will demand that unlicensed devices cease operation at the first sign of interference (or potential interference) to wide-area systems
  - These worries are based upon the unrealistic expectations of some wide-area AVM system designers to operate in a very quiet RF environment
  - The Part 15 industry has implied incorrectly that all wide-area systems are equally susceptible to interference from the operation of Part 15 devices
- Part 15 industry generally is *not* concerned about the ability of their devices to operate in the presence of wide-area signals
- Wide-area AVM systems should and can be designed to tolerate reasonable levels of interference in the 902-928 MHz band
  - ARRAY™ has been designed to account for potential interference from Part 15 devices (and local-area systems) through various means, including base station placement, power levels, and high level protocol error recovery
  - In their latest comments, other wide-area system developers have acknowledged the availability of these methods to make their systems more robust

The Potential for Interference to Wide-Area Systems Has Been Overstated in the Record

- By focusing on individual radio links and assuming simultaneous operation, the studies submitted in this proceeding overestimate the interference threat from Part 15 devices (and local-area systems)
- When the potential for interference is analyzed on a system basis, the potential is demonstrated in its true light and the problem is properly perceived as manageable by well-designed AVM systems
  - Proper power levels (with room to increase power as the noise in the band increases over time)
  - High-capacity (high level protocol error recovery)
  - Operation over reasonable ranges (moderate base station spacing)

The Commission Should Adopt a Quantitative Definition of "Harmful Interference"

- Wide-area AVM industry supports adoption of an objective standard of "harmful interference" in the 902-928 MHz band from Part 15 devices
  - Objective standard would remove uncertainty in disputes and facilitate resolution in cases of alleged harmful interference
  - Both wide-area system and Part 15 device developers would have benchmark for measuring compatibility
- The current definition of "harmful interference" effectively places users of Part 15 devices at the mercy of licensed systems
- Pinpoint has suggested that the Commission adopt a definition of harmful interference to which Part 15 proponents can design their devices and configure their installations patterned after the following:
  - The interference should be measured by the power received at an AVM antenna
  - Any signal at -90 dBm or less must be tolerated indefinitely by the AVM system
  - Any signal at -70 dBm or above will be considered to cause harmful interference to the AVM system
  - Any signal between -90 and -70 dBm will be tolerated for "x" per cent of the time over any ten second period, where "x" equals (5.0/dBm)•(-70 dBm – (power level of the signal received at the AVM antenna)).

The Commission Should Not Drop the Proposed Allocation of 902-928 MHz to AVM in Favor of Enhancing the Position of Part 15 Devices

- Part 15 industry asks the Commission to overturn long-standing and sound spectrum allocation policies
- Consideration of other spectrum for wide-area AVM would delay implementation of wide-area AVM by several years right at the time several operators are ready to implement their networks
- Commission has recently made available over 40 MHz of unlicensed PCS spectrum that could be used for Part 15 devices in addition to the hundreds of MHz that could be used to support the functions such devices serve, on both a licensed and unlicensed basis
  - Part 15 devices are also allowed to operate with high power at 2400-2483.5 MHz and 5725-5850 MHz. This is 8 times the spectrum available at 902-928 MHz.
- Commission has recognized in the past that users of Part 15 devices should turn to licensed services when Part 15 operation is inadequate
- No other viable spectrum is available for wide-area AVM
  - Spectrum recently released by NTIA around 2.4 GHz inappropriate for wide-area AVM
    - Absorption of the signal is far greater
    - Significantly greater multipath problems even with line-of-sight
  - Problems for AVM at 4 GHz even worse

Consistent with Continued Operation of Part 15 Devices, a Band Plan Is Available That Would Accommodate the Diversity of Wide-Area AVM Proponents

- Pinpoint modification of basic Teletrac proposal
- 912-928 MHz sub-band available to wide-area AVM systems on time-sharing basis and co-primary with local-area AVM systems
- 902-912 MHz sub-band available to wide-area AVM systems on a primary basis, generally superior to local-area systems
- Part 15 devices continue to operate throughout the entire band subject to obligations of noninterfering operation, as defined by the objective standard of "harmful interference"

Pinpoint

912-928 MHz Sub-Band

- Wide-area and local-area systems share on a co-primary basis
- All financially and technically qualified wide-area AVM applicants filing within a filing window would negotiate a time-sharing arrangement from common, equivalent bargaining positions
  - Negotiated arrangements may include elements of frequency division, CDMA, statistical spatial diversity, wideband forward links, and other characteristics of particular qualifying designs
  - In the absence of a successful negotiation, simple default round-robin arrangement would take effect
  - Plan has the potential for future entrants through reopening of the window
- Sub-band would give local-area AVM systems opportunities for a least two, and as many as three, 6 MHz channels, as desired by several local-area system proponents
- Wide-area systems would have to tolerate Part 15 devices up to a certain interference ceiling

The Wider Bandwidth Made Available Through the Shared 912-928 MHz Band Will Be Critical to High-Speed, Accurate Vehicle Location

- The large capacity of Pinpoint's ARRAY™ system is critically dependent on available bandwidth
  - Severe multipath distortions characteristic of the mobile communications environment can be effectively ameliorated by the signal resolution at bandwidths of 12 MHz and above
  - The vehicle location rate increases significantly faster than the occupied bandwidth for bandwidths less than 30 MHz
  - Wider bandwidths give designers more flexibility and lead to significant gains in data and radiolocation throughput
- The greater capacity of wider bandwidth systems allows the FCC to maximize the use of this band while establishing a competitive marketplace
- Much like the "Steinbrecher Box", Pinpoint's system uses wider bandwidth to increase the spectrum efficiency over that which can be achieved through simple, narrower bandwidth frequency division

902-912 MHz Sub-Band

- Commission could license this sub-band in one of several ways:
  - frequency division
    - *e.g.*, 902-906 MHz, 906-910 MHz, 910-912 MHz channelization
    - would seem to accommodate, for example, MobileVision, Teletrac, and Southwestern Bell
    - narrowband forward links could be located within the system's channel or at 927.5 - 928 MHz
  - statistical spatial diversity (Teletrac ex parte proposal)
  - time-sharing
- Any grant of exclusivity in the face of mutually exclusive may require spectrum auctions under recent Communications Act amendments
- Existing local-area systems should be grandfathered and required to move only in instances of actual interference that are not otherwise reconciled
- Local-area AVM systems should be permitted to attenuate side-band energy below 912 MHz on a primary basis subject to strict power limits
- Wide-area systems in this sub-band also would have to tolerate Part 15 devices up to a certain interference ceiling

Other Operations Should Be Consistent With Shared Use of the 902-928 MHz Band

- Voice operations
  - Emergency basis only in a limited segment near the band edge at 902 and/or 928 MHz
  - Otherwise, in cellular, SMRS, PCS, or other private radio or common carrier bands
- Data operations
  - On same signal as vehicle location pulses (Pinpoint)
  - In same channel as vehicle location pulses (Southwestern Bell) subject to any sharing mechanism in place
  - In narrowband forward link

Pinpoint
COMMUNICATIONS INC

The Commission Should Allocate the 902-928 MHz Band to Wide-Area AVM Expeditiously

- As the Commission recognizes, wide-area AVM will bring a host of important services to the American public and will be central to the introduction of IVHS
- The industry has been under a cloud of uncertainty for almost two years
- Any substantial further delay may weaken the present opportunities to establish a highly competitive environment for the provision of AVM services, in our nation's urban centers in particular

Pinpoint

PINPOINT'S ARRAY™ WIDE-AREA AVM SYSTEM

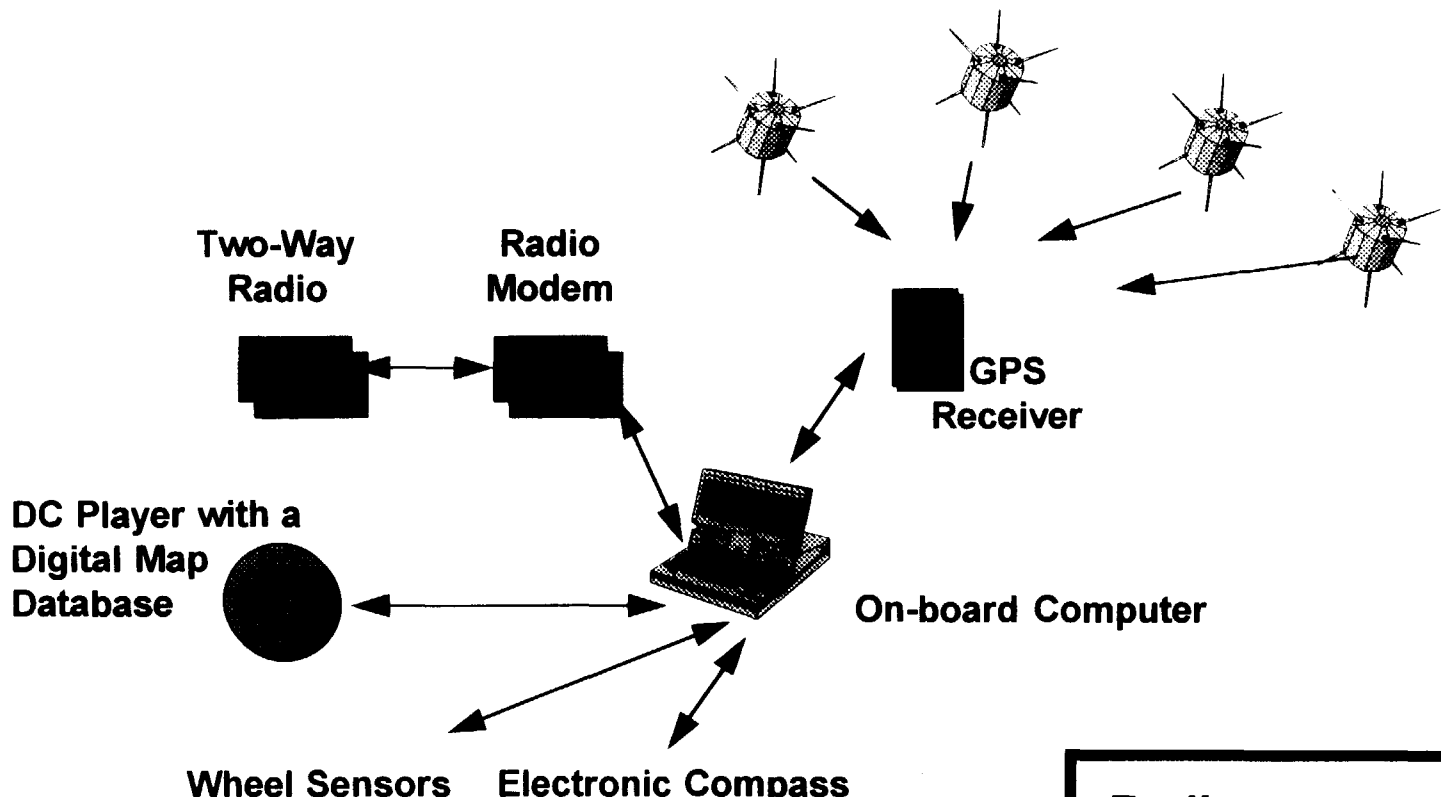
- Designed to operate in the high-noise environment of the 902-928 MHz band
  - Can share with other wide-area systems
  - Can share with local-area AVM systems
  - Capable of tolerating significant level of Part 15 operations
- Designed to meet high-capacity needs of IVHS applications
  - Pinpoint can support IVHS initiatives requiring hundreds of vehicles to be located per hour
    - wide-area traffic monitoring and control
    - traveler information systems
    - public and private safety
    - mass transit systems management
  - Pinpoint provides 3000 position fixes per second in a metro area
    - 10-250 times more capacity than other wide-area AVM systems
    - Teletrac (35/second) would be consumed by needs of police department in medium-sized city
    - SW Bell (4-20/sec) would be exhausted by a moderately-sized taxi company
  - Accurate and high-capacity radiolocation is dependent on wide bandwidth
    - ameliorate severe multipath at bandwidths greater than 12 MHz
    - radiolocation rate increases significantly greater than increases in bandwidth
  - Ability to operate AVM over wide bandwidth on a time-shared basis will increase overall spectrum efficiency of the band as compared to narrower channelization

GPS is Inefficient for Urban Vehicle Location Applications

- Requires line-of-sight with 4 satellites
  - Only 24 orbit the planet
  - Buildings and trees frequently block out line-of-sight
  - Long set up time (20 seconds to 2 minutes) for initial position-fix
- Poor accuracy: 340 feet accuracy with 95% probability if in coverage (line-of-sight)
- Expensive differential GPS services can increase accuracy
  - $10 to $40 per month; and accuracies vary
  - DoD is considering regulating differential GPS services for national security reasons
- Only tells vehicle where it is located. No one else knows.

Pinpoint Communications, Inc.
Ex Parte Presentation
PR Docket No. 93-61

GPS+Dead Reckoning+2 Way Radio+Modem+Airtime = Very Expensive and Inefficient Solution



Cost to xmit location =	$ 0.05 per location
Once a minute average =	$ 3.00 per hour
	$24.00 per day

Radio =	$ 500
Modem =	200
GPS Rec. =	500
Dead Reckoning =	1,500
Total Hardware =	$2,700

Before the
Federal Communications Commission
Washington, D.C. 20554

GEN. Docket No. 87-389

In the Matter of

Revision of Part 15	RM-5193
of the Rules regarding	RM-5250
the operation of radio	RM-5575
frequency devices without an individual license.	

FIRST REPORT AND ORDER

Adopted: March 30, 1989; Released: April 18, 1989

By the Commission:

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INTRODUCTION

1. By this action, the Commission is amending Parts 2 and 15 of the Rules regarding the non-licensed operation of radio frequency (RF) devices and the equipment authorization procedures associated with this equipment.

with the comments that a limit on maximum output power over a specified frequency range is a more appropriate standard for this type of equipment. Accordingly, we are adopting a power output limit of 10 watts over the frequency range 9-45 kHz and one watt over the frequency range 45-490 kHz, as proposed by Dynatel. In addition, we are requiring cable locating equipment to comply with the AC power line conducted emission limits for those devices that connect to the AC power line.

3. New Bands

55. In the *Notice*, we proposed to authorize the operation of Part 15 devices on a number of new frequency bands, namely the frequency bands allocated to industrial, scientific and medical (ISM) devices, [19] at higher emission levels. These frequency bands are: 13.553-13.567 MHz, 26.96-27.28 MHz, 40.66-40.70 MHz, 902-928 MHz, 2400-2483.5 MHz, 5725-5875 MHz, and 24.0-24.25 GHz. As under the general limits, operation within these bands would not entail restrictions on channelization, bandwidth, type of modulation, or type of operation. The Commission stated that establishment of these new bands would enable manufacturers to introduce new equipment providing major benefits to consumers and to take advantage of new technologies without the need for Commission rule making.

56. A number of commenters object to permitting the operation of Part 15 devices on ISM frequency bands. FAA indicates that allowing operation of Part 15 devices on the ISM bands is a disservice to the public, as there are many Government and commercial operations with high powered transmissions within and adjacent to these bands. FAA states that ISM bands allocated to the government should not become locations for concentrations of Part 15 devices. Other comments, such as those of Allen-Bradley and GE, express the belief that such a large number of Part 15 users might operate on the ISM bands that the Commission might decide to implement restrictions on authorized ISM users to protect the operators of Part 15 devices from interference. The League and individual ARS operators object to allowing Part 15 devices within ISM frequency bands allocated to the Amateur Radio Service, citing the possibility of interference both to and from Part 15 operation. [20]

57. GM, on the other hand, supports the use of the proposed new bands by Part 15 devices. GM states that the FCC should leave the decision of whether any high power transmission, be it from ISM equipment, U. S. Government systems, or amateur radio, will cause interference to a Part 15 device to the manufacturer and its engineering staff. SEIA, in its comments, states that Part 18 devices are allowed unlimited radiation in the ISM bands, and, since both Part 18 and Part 15 devices are regulated to protect authorized services, these devices should be treated similarly with respect to emission limits. Other comments from the manufacturers of control and security alarm devices request that a new classification be established under Part 15 to permit higher emissions levels for Part 15 devices located in industrial, commercial or business establishments. They indicate such an approach would be similar to the differentiation between Class A and Class B computers. [21] In support of this approach they indicate that spurious emissions from transmitters in the authorized radio services are now permitted at higher levels than emissions from Part 15 devices. NTIA responds to these comments by stating that the number of transmitters in the authorized services is a small fraction of the number of Part 15 devices. NTIA also states that interference from a licensed transmitter generally can more easily be traced and eliminated than interference from Part 15 devices because the frequency and location of a licensed station are ordinarily known, whereas it is more difficult and expensive to locate and eliminate a multitude of Part 15 devices.

58. We continue to believe that there are many possible applications for Part 15 devices within these ISM bands. The fact that these frequencies may not be suitable for certain consumer devices is not a reason to prohibit Part 15 operation. We note that presently there are many Part 15 applications that are tolerant of interference or isolated from potential interference sources. We believe that manufacturers, if given the opportunity to use the ISM frequencies, will develop many new and practical uses of Part 15 devices. Thus, we will not restrict the use of these bands by Part 15 equipment because of the possibility of interference to that equipment by equipment operating under other rule parts.

59. We also believe that the probability that Part 15 operations will cause interference to authorized services in the ISM bands above 900 MHz is low. First, the rate at which radiated emissions are attenuated, especially from intervening objects, is quite high in these bands. Second, the potential for the Part 15 device to receive interference is much greater than the potential for the Part 15 device to cause interference. Because of the possible applications which exist for viable uses of these bands, the proposed rules are being implemented.

60. As for requests from SEIA that Part 15 devices be permitted to operate with additional field strength in the bands allocated for ISM operation under Part 18, we note that Part 18 is an authorized service. Part 18 devices are permitted to radiate without a limit on the level of radiation only in those frequency bands in which ISM operation is the primary authorized service. Part 18 devices operated in this manner are not required to provide any protection from interference to other authorized services located within the ISM bands. For this reason and the potential for such Part 15 devices to cause interference to authorized radio services located in the ISM bands, we are denying SEIA's request. Further, we find that the request by the manufacturers of control and security alarm devices to establish a special classification under the Part 15 rules permitting higher emissions is beyond the scope of this proceeding. We also note that, in many instances, the need for higher emissions levels can be met through operation under one of the authorized services. In view of the absence of interference protection for Part 15 devices, it would appear that, wherever possible, operation under the authorized services would be preferable to operation under the Part 15 rules. We therefore encourage parties with need to operate RF equipment at higher emissions levels than those permitted herein to seek authorization under other provisions of our rules.

4. Restricted Bands

61. *Frequency Bands Designated as Restricted.* In the *Notice*, we proposed to prohibit the operation of Part 15 intentional radiators on the frequencies used by certain sensitive radio services, i.e., frequency bands allocated for services involving safety-of-life or for services that utilize very low received signal levels. [22] These proposed restricted bands were coordinated with the NTIA prior to

PINPOINT

WASHINGTON, DC

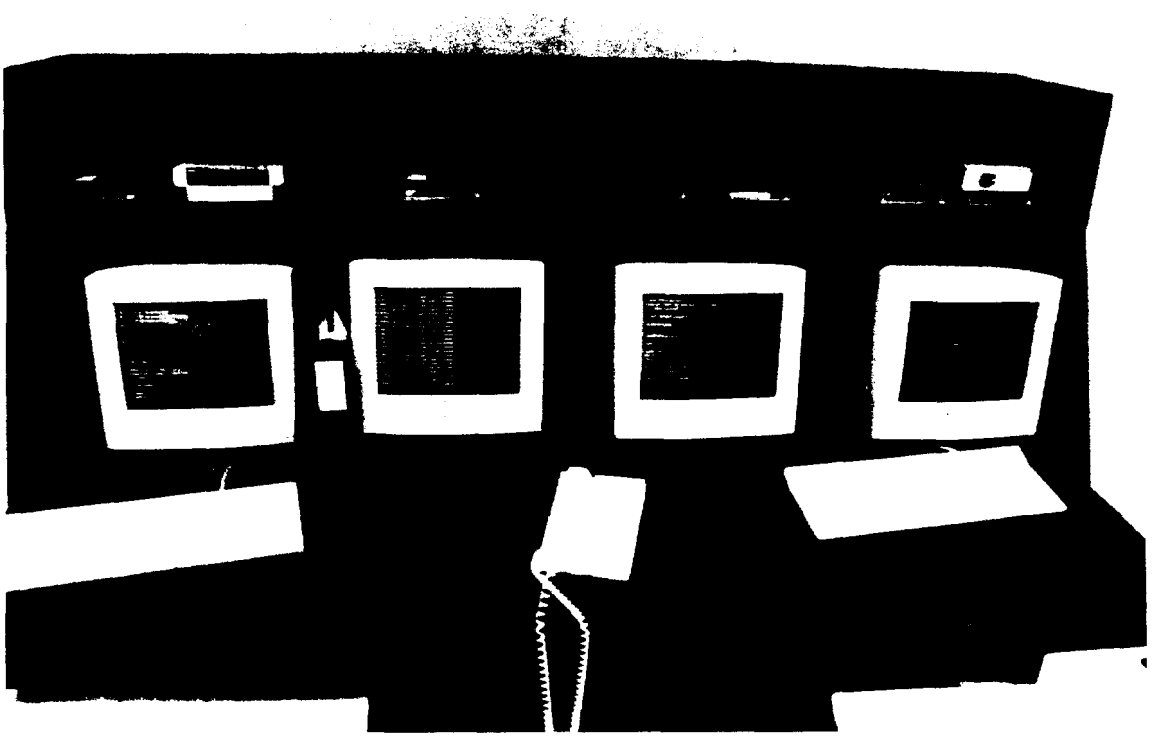
EXPERIMENTAL SYSTEM

FOR

AUTOMATIC VEHICLE MONITORING

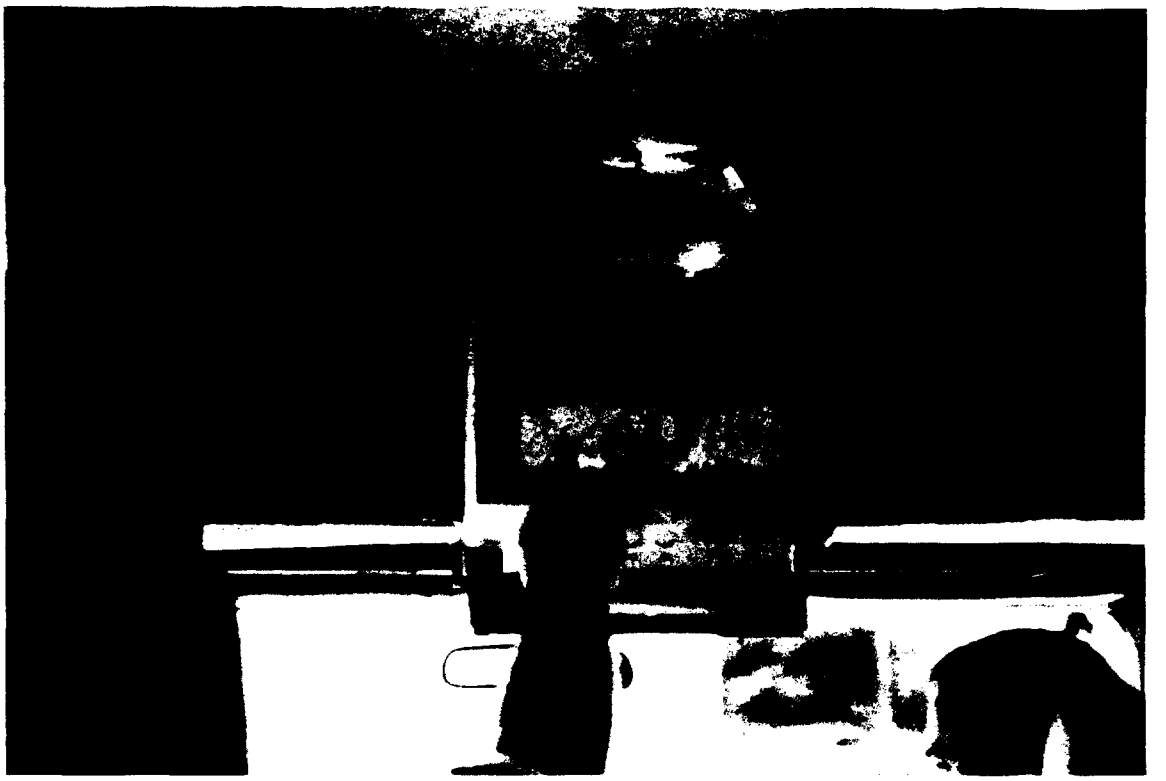
1993-1994

Dispatching Center (left) and Map Display (right): Data Communications are Tracknet™ Capable



Experimental System Network Control Center

↑	↑	↑	↑
Diagnostic CPU	Navigation CPU	Scheduling Control	Data Communications CPU



Mobile Application Terminal (MAP) - TRACKNET™

Mobile Demonstration Unit